

State of California
California Regional Water Quality Control Board, Los Angeles Region

Draft Technical Staff Report

**Evidence in support of an
Amendment to the
*Water Quality Control Plan for the Coastal Watersheds
of Los Angeles and Ventura Counties*
to Prohibit On-site Wastewater Disposal Systems
in the Malibu Civic Center Area**

July 31, 2009

**D
R
A
F
T

J
U
L
Y

3
1

2
0
0
9**

Table of Content

	<u>Page Numbers</u>
Technical Staff Report Overview	1-10
<i>Wendy Phillips</i>	
Technical Memorandum #1: Permitted Dischargers Have Poor Records of Compliance with Regional Board Orders	T1-1 to T1-5
<i>Rebecca Chou</i>	
Technical Memorandum #2: Pathogens and Nitrogen in Wastewaters Impair Underlying Groundwater as a Potential Source of Drinking Water	
<i>David Koo</i>	T2-1 to T2-7
Attachment 2-1 Data Tables for 47 Individual Wells.....	T2-8 to T2-51
Attachment 2-2 Graphs for 47 Individual Well.....	T2-52 to T2-95
Technical Memorandum #3: Pathogens in Wastewaters that are in Hydraulic Connection with Beaches are a Significant Source of Impairment to Body Contact Recreation	T3-1 to T3-47
<i>Elizabeth Erickson</i>	
Technical Memorandum #4: Nitrogen Loads in Wastewaters flowing to Malibu Lagoon Are a Significant Source of Impairment to Aquatic Life	T4-1 to T4-33
<i>Toni Callaway and Orlando Gonzalez</i>	
Attachment 4-1 Nitrogen Mass Loading for Malibu Lagoon and Review Summary of Previous Studies on Mass Loading from WODS to the Lagoon..	T4-34 to T4-43
<i>C. P. Lai</i>	
Technical Memorandum #5: Dischargers with Unsuitable Hydrogeologic Conditions for High Flows of Wastewaters Resort to Hauling Liquid Sewage and Sludge to Communities that have Sewer and Wastewater Treatment Facilities	
<i>Dionisia Rodriguez and Ryan Thacher</i>	

D
R
A
F
T

J
U
L
Y

3
1

2
0
0
9

**State of California
California Regional Water Quality Control Board, Los Angeles Region**

Draft Technical Staff Report

**Evidence in support of an
Amendment to the
*Water Quality Control Plan for the Coastal Watersheds
of Los Angeles and Ventura Counties*
to incorporate a Prohibition on On-site Wastewater Disposal Systems
in the Malibu Civic Center Area**

Technical Staff Report Overview

**by
Wendy Phillips,* P.G., C.H.G., C.E.G.
Chief, Groundwater Permitting and Landfill Section**

**In addition to her current colleagues in the Groundwater Permitting Unit, the author expresses appreciation for TMDL contributions from Jenny Newman, CP Lai and Eric Wu, post-production contributions from Rosie Villar, Enrique Casas, Jeff Ogata, Rodney Nelson, and Joe Luera, and contributions from past colleagues Rick Viergutz, Hugh Marley, Morton Price, and Dennis Dickerson.*

**D
R
A
F
T

J
U
L
Y

3
1

2
0
0
9**

Technical Staff Report Overview
by
Wendy Phillips, P.G., C.H.G., C.E.G.
Chief, Groundwater Permitting and Landfill Section

**D
R
A
F
T

J
U
L
Y

3
1

2
0
0
9**

Introduction

The purpose of this Technical Staff Report is to present evidence in support of an amendment to the *Water Quality Control Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan)*, to prohibit subsurface disposal systems in the Malibu Civic Center area. The Malibu Civic Center area, shown in Figure 1, includes Malibu Valley, Winter Canyon, and the adjacent coastal strips of land and beaches. Types of subsurface disposal systems that would be prohibited by the amendment to the *Basin Plan* range from passive systems with conventional septic tanks to active systems that more aggressively remove pollutant loads from sewage before subsurface disposal. The prohibition would apply to systems that serve individual properties (residential, commercial, industrial, and public properties) as well as groups of those properties. Collectively throughout this report, these disposal systems are referred to as on-site wastewater disposal systems, or OWDSs.

Environmental Setting

Background

The Malibu Civic Center area supports a population of about 1,000 residents and is the core of the City's business, cultural, and commercial activities. The area, which includes the renowned Surfrider Beach, attracts a high volume of visitors.

Without community sewers and wastewater treatment infrastructure, residents, businesses, and public facilities in the City of Malibu use thousands of on-site disposal systems to discharge their sewage to the subsurface and underlying groundwater. In several areas of the City, unfavorable hydrogeologic conditions coupled with high flows of wastewaters have raised concerns about reliance on this wastewater disposal strategy. In one of those areas of concern, the Malibu Civic Center area, intensive land use activities by almost 400 dischargers result in the release of wastewaters to the subsurface at a rate that Regional Board staff estimates to be as high as 255,000 gallons per day (gpd).

Water Resources

Surface waters in the Malibu Civic Center area include Malibu Creek, Malibu Lagoon – a fresh/saltwater habitat for rare, threatened, and endangered species, and ocean beaches, which are heavily used by the resident population as well as visitors. Groundwater in the area is a historic and potential source of drinking water. In the *Basin Plan*, the Regional Board has formally designated these plus other beneficial uses for the water resources in the area as follows:

Malibu Lagoon: Navigation; Water Contact Recreation; Non-contact Water Recreation; Estuarine Habitat; Marine Habitat; Wildlife Habitat; Rare, Threatened, or Endangered Species Habitat; Migration of Aquatic Organisms; Spawning, Reproduction, and/or Early Development; Wetland Habitat.

Malibu Creek: Water Contact Recreation; Non-contact Water Recreation; Warm Freshwater Habitat; Cold Freshwater Habitat; Wildlife Habitat; Rare, Threatened, or Endangered Species Habitat; Migration of Aquatic Organisms; Spawning, Reproduction, and/or Early Development; Wetland Habitat.

Malibu Beach and Malibu Lagoon Beach (Surfrider Beach), Amarillo Beach, and Carbon Beach: Navigation; Water Contact Recreation; Non-contact Water Recreation; Commercial and Sport Fishing; Marine Habitat; Wildlife Habitat; Spawning, Reproduction, and/or Early Development; and Shellfish Harvesting.

Groundwater: Municipal and Domestic Supply (Potential), Industrial Process and Service Supply, and Agricultural Supply.

Also in the *Basin Plan*, the Regional Board has established water quality objectives to protect the beneficial uses identified above.

Impairments to Beneficial Uses of Water Resources

In a 2006 Clean Water Act Section 303(d) list, approved by the United States Environmental Protection Agency (US EPA) on June 28, 2007, impairments to beneficial uses are formally identified for the following water resources:

- Malibu Lagoon: impaired by Coliform Bacteria, Eutrophication.
- Malibu Creek: impaired by Coliform Bacteria, Nutrients (Algae).
- Malibu Beach: impaired by Indicator Bacteria.
- Malibu Lagoon Beach (Surfrider Beach): impaired by Coliform Bacteria.
- Carbon Beach: impaired by Indicator Bacteria.

To restore water quality and impaired beneficial uses, the US EPA and/or Regional Board have adopted the following Total Maximum Daily Loads (TMDLs):

- a. **Malibu Creek Watershed Nutrient TMDL:** The US EPA, on March 21, 2003, specified a numeric target of 1.0 mg/l for total nitrogen during summer months (April 15 to November 15) and a numeric target of 8.0 mg/L for total nitrogen during winter months (November 16 to April 14). Significant sources of the nutrient pollutants include discharges of wastewaters from commercial, public, and residential landuse activities. The TMDL specifies a load allocation for on-site wastewater disposal systems of 6 lbs/day during the summer months and 8 mg/L during winter months.
- b. **Malibu Creek and Lagoon Bacteria TMDL:** The Regional Board specified numeric targets, effective January 24, 2006, based on single sample and geometric

mean bacteria water quality objectives in the *Basin Plan* to protect the water contact recreation use. Sources of bacteria loading include storm water runoff, dry-weather runoff, on-site wastewater disposal systems, and animal wastes. The TMDL specifies load allocations for on-site wastewater disposal systems equal to the allowable number of exceedance days of the numeric targets. There are no allowable exceedance days of the geometric mean numeric targets. For the single sample numeric targets, based on daily sampling, in summer (April 1 to October 31), there are no allowable exceedance days, in winter dry weather (November 1 to March 31), there are three allowable exceedances days, and in wet weather (defined as days with ≥ 0.1 and the three days following the rain event), there are 17 allowable exceedance days.

- c. **Santa Monica Bay Beaches Wet and Dry Bacteria TMDL:** For beaches along the Santa Monica Bay impaired by bacteria in dry and wet weather, the Regional Board specified numeric targets, effective July 15, 2003, based on the single sample and geometric mean bacteria water quality objectives in the *Basin Plan* to protect the water contact recreation use. The dry weather TMDL identified the sources of bacteria loading as dry-weather urban runoff, natural source runoff and groundwater. The wet weather TMDL identified stormwater runoff as a major source. The TMDLs did not provide load allocations for on-site wastewater disposal systems, meaning that no exceedances of the numeric targets are permissible as a result of discharges from non-point sources, including on-site wastewater disposal systems. There are no allowable exceedance days of the geometric mean numeric targets. For the single sample numeric targets, based on daily sampling, in summer (April 1 to October 31), there are no allowable exceedance days, in winter dry weather (November 1 to March 31), there are three allowable exceedances days, and in wet weather (defined as days with ≥ 0.1 and the three days following the rain event), there are 17 allowable exceedance days.

Summary of Evidence

Staff investigations focused in five areas and are presented in five technical memoranda that comprise this staff report, and that meet the requirements of the California Water Code, sections 13280 and 13281 for determination that discharges of OWDSs in the Malibu Civic Center area result in violation of water quality objectives, will impair present or future beneficial uses of water, will cause pollution, nuisance, or contamination, or will unreasonably degrade the quality of any water of the state.

Technical Memorandum #1: Permitted Dischargers Have Poor Records of Compliance with Regional Board Orders.

For the privilege of discharging wastewater to a water of the state (including both surface water and groundwater), dischargers must comply with waste discharge requirements (WDRs) that are specified in Orders issued by the Regional Board. The WDRs generally incorporate monitoring and reporting programs that rely on self-monitoring by dischargers. The reports of self-

monitoring are used by the Regional Board to determine compliance and to ensure that the quality of the water into which wastes are discharged is not degraded and that beneficial uses, such as drinking water and swimming (body contact recreation) are protected.

In the Malibu Civic Center area, the Regional Board regulates 21 discharges, all of which are from commercial, industrial, or public facilities. In a review of the compliance records for 20¹ of the 21 discharges, each dischargers had a record of violations. Among the most serious violations are repeated failures to achieve effluent limits specified in WDRs; in particular, limits for pathogens and nutrients (species of nitrogen and phosphorus) that are identified as pollutants in nearby waters that the Regional Board and EPA have designated as impaired under Clean Water Act section 303(d). Also, several dischargers 'failed to submit' monitoring reports, and compliance with technical requirements in their WDRs could not be determined.

Among the minor violations included in Table 1-1 are tardy submittal of reports of self-monitoring required by the WDRs and improper certifications of those monitoring reports – e.g. a perjury statement executed by a party not authorized to certify the accuracy of the results on behalf of the discharger, and/or modifications to the language of the perjury statement that is specified in a WDR.

Staff concludes that dischargers have poor records of compliance with Orders issued by Regional Board, and that discharges are, in general, not meeting requirements prescribed to protect water quality and beneficial uses.

Technical Memorandum #2: Pathogens and Nitrogen in Wastewaters Impair Underlying Groundwater as a Potential Source of Drinking Water.

Although groundwater in the Malibu Valley Groundwater Basin is not an existing source of drinking water to the community, groundwater was the community's source of drinking water until the 1960s. Groundwater production in the area gradually ceased as a newly formed special district – Los Angeles County Waterworks District No. 29, Malibu – started delivering imported water to the Malibu area and Topanga Canyon in the early 1960s. As a future resource – and also in the event of a disruption of deliveries of imported water, groundwater is an important local resource that the community may need to use in the future. The Regional Board recognized this beneficial use, in designating groundwater as a potential source of drinking water in the *Basin Plan*.

To evaluate impacts from OWDSs on groundwater as a potential source of drinking water, staff identified 47 groundwater wells, all of which were designed and constructed for monitoring the quality of groundwater, and compiled data pathogens and nitrogen. To examine the extent of impairment of this groundwater for drinking water, staff compiled all available analytical results of sampling for pathogen indicators and nitrogen species during the period July 2002 through May 2009 and compared these results with drinking water standards for these pollutants. As summarized in graphs and tables for each well:

¹ One discharger, Malibu Lumber, did not commence discharge until April 2009, subsequent to the staff's evaluation of compliance records. Since commencement of the discharge, this discharger has been in violation of its WDR.

- ***Pathogens in Groundwater do not meet the Drinking Water Standard:*** Forty-four wells, or 94% of the 47 wells, had fecal coliform during at least one sampling period. Of the 671 fecal coliform samples collected from the 47 wells during the review period, 360 samples (54%) tested positive and exceeded the maximum contaminant level (MCL) of less than 1.1 MPN/100ml (Most Probable Number per 100 milliliters).
- ***Nitrogen in Groundwater does not meet the⁴ Drinking Water Standard:*** Fourteen wells, or 30% of the 47 wells, had nitrate plus nitrite at levels above the MCL of 10 mg/L (as nitrogen). Of the 671 samples collected from the 47 wells during the review period, 100 (15%) were above the MCL. Although there is no drinking water standard for ammonia, staff also reviewed analytical data for ammonia in view of the likelihood that the ammonia species of nitrogen will nitrify. These results indicate that, when concentrations of ammonia (converted to nitrogen) are added to concentrations of nitrate and nitrite, 163 samples or 24% were above the MCL. Twenty-four wells, or 51% of the 47 wells, had levels above the MCL of 10 mg/L.

As indicated by coliform results, pathogens are present in groundwater at levels that elevate the risk of infectious disease should this groundwater be used for potable purposes. As indicated by the nitrogen results, species of nitrogen are present in groundwater at levels that can cause health problems in humans should this groundwater be used for potable purposes. Infants and fetuses are particularly sensitive and can develop methemoglobinemia (blue-baby syndrome) from ingestion of water with nitrate at levels that deplete oxygen in the blood stream.

Technical Memorandum #3: Pathogens in Wastewaters that are in Hydraulic Connection with Beaches are a Significant Source of Impairment to Water Contact Recreation.

Malibu Creek, Lagoon, and nearby beaches are popular not only within the local community but as a destination for visitors as well. In the *Basin Plan*, the Regional Board has designated these waters for both water contact recreation (e.g. swimming) and non-contact water recreation (e.g. sunbathing, aesthetic enjoyment), and set standards at levels that will protect human health.

As determined by the Regional Board and US Environmental Protection Agency, surface waters in the Malibu Creek Civic Center area are impaired for water contact recreation, consistently failing to meet standards set to protect swimmers and surfers from infectious disease resulting from direct exposure to or incidental ingestion of polluted waters during recreation. Repeated failures to meet standards for standards have resulted in a ‘beach bummer’ reputation for the renowned Surfrider Beach.

To examine the hydraulic connection of discharges from OWDSs through groundwater to nearby surface waters, staff evaluated more than 8,000 samples of wastewater effluent, underlying or nearby groundwater, and surface waters. Staff determined that pathogens from wastewaters migrate to surface waters and that, consistent with data supporting the designations of impairments, the levels of pathogens do not meet standards protective of human health. Staff also determined that risks of infectious disease from water contact recreation were elevated at beaches in the Malibu Civic Center area versus comparable beaches with sewers.

D
R
A
F
T

J
U
L
Y

3
1

2
0
0
9

Staff also reviewed numerous previous studies, and found conclusions from these other studies to be consistent with staff's determination of impairment to beneficial use of water contact recreation.

5

Technical Memorandum #4: Nitrogen Loads in Wastewaters flowing to Malibu Lagoon Are a Significant Source of Impairment to Aquatic Life.

Malibu Lagoon supports a valuable wetland ecosystem and nearby plant communities such as the coastal salt marsh and the coastal strand, and also serves as refuge for migrating birds (with over 200 observed species). These beneficial uses are impaired by excessive nutrients levels in the lagoon, depleting dissolved oxygen in the water and stimulating aquatic growth (algae). As established in the nutrient TMDL² adopted by the US EPA on March 21, 2003 for Malibu Lagoon, nitrogen from OWDSs in hydraulic connection with the lagoon are subject to a load allocation of six pounds per day.

To quantify current nitrogen loads from OWDSs in the Malibu Civic Center area to the lagoon, staff compiled an inventory of 38 commercial dischargers and 349 residential dischargers. Using real data where available and reasonable assumptions (based on published literature and best professional judgment) for data gaps, staff calculated that the dischargers release about 255,000 gpd through OWDSs and estimated nitrogen loading factors. Applying these nitrogen loading factors to update an existing numerical model designed and calibrated by Questa 2005 for an earlier investigation, staff estimates that nitrogen loads released from OWDSs and transmitted via groundwaters to Malibu Lagoon total 29 pounds per day (lb/day). As a check, staff used the same flows and loading factors to a 'spreadsheet' model which characterized wastewater transport by hydrogeologic sector. Based on the 'spreadsheet' model, staff estimates that wastewaters transport 36 lb/day into Malibu Lagoon.

Staff's estimates of 29 lb/day to 36 lb/day from the numeric and 'spreadsheet' models are greater than two of the estimates (17 lb/day to 20 lb/day) prepared by the third parties in previous studies, and slightly overlap the estimate by the other third party (32 lb/day). Among the factors accounting for the range in estimates between staff's estimates and third-party estimates are:

- Commercial Flows: The third-party models used significantly lower assumptions for commercial wastewater flows.
- Nitrogen Concentrations – Residential: Two of the three third-party models assumed that residential wastewaters have nitrogen concentrations that are about one-half of what staff determined is a reasonable assumption.
- Nitrogen Concentration – Commercial: Staff determined that the average nitrogen concentration of commercial wastewater discharges has decreased since 2004, as OWTSS

² In the Malibu Creek Watershed Nutrient TMDL (March 21, 2003), the US EPA specifies a numeric target of 1.0 mg/l for total nitrogen during summer months (April 15 to November 15) and a numeric target of 8.0 mg/L for total nitrogen during winter months (November 16 to April 14). Significant sources of the nutrient pollutants include discharges of wastewaters from commercial, public, and residential land use activities. The TMDL specifies a load allocation for on-site wastewater treatment systems of 6 lbs/day during the summer months and 8 mg/L during winter months.

with greater treatment capabilities has been brought on-line. However, this declining trend in this subset of OWTSs is not great enough to meet the TMDL goal.

Regardless of differing assumptions and models used in the estimates, all estimates – including those prepared by staff as well as past estimates prepared by third parties – indicate that nitrogen loads from OWDSs are significantly above the load allocation of 6 lb/day for OWDSs established in a TMDL. Accordingly, staff concludes that OWDSs in the Malibu Civic Center area cumulatively release nitrogen at rates that contribute to eutrophication and impair aquatic life in Malibu Lagoon. This conclusion is supported by staff’s estimates ranging from 29 lb/day to 36 lb/day as wells as third-party estimates from 17 lb/day to 32 lb/day, all of which fail to meet targets established to restore water quality and protect beneficial uses in Malibu Lagoon.

Technical Memorandum No. 5: Dischargers with Unsuitable Hydrogeologic Conditions for High Flows of Wastewaters Resort to Hauling Liquid Sewage and Sludge to Communities that have Sewer and Wastewater Treatment Facilities.

Intensive land use activities on many properties in the Malibu Civic Center area generate wastewater flows at rates that exceed the capacity of OWDSs to transmit the wastewaters into the subsurface. While some dischargers are limited by treatment equipment that has inadequate capacity and/or treatment capabilities, many dischargers do not have adequate disposal capacity on their properties to transmit the wastewaters into the subsurface. Their disposal rates can be constrained not only by lack of space, or area, for on-site disposal fields, but by hydrogeologic constraints as well, such as a high water table or tight soils. Consequently, in order to avoid failure of the OWDSs, a significant number of large dischargers resort to hauling liquid sewage and sludge to communities that have infrastructure to accept their liquid wastes.

To quantify reliance on the practice of hauling, staff reviewed reports of self-monitoring, which include summaries of off-site hauling, submitted by ten large commercial dischargers. In 2008, these ten dischargers, whose activities generated a total of approximately 28 million gallons of wastewater (77,000 gpd), hauled almost 2 million gallons (5,500 gpd), or about 7%, of their raw sewage to off-site disposal facilities. Furthermore, staff quantified trends from 2004 through 2008, which indicate that these ten dischargers have cumulatively increased their rate of wastewater generation by 15% and their rate of hauling by 29%. (Staff was not unable use existing data from dischargers to analyze seasonal hauling trends – e.g. hauling trends during the wet season, and also during warm summer holidays when populations have high peaks.)

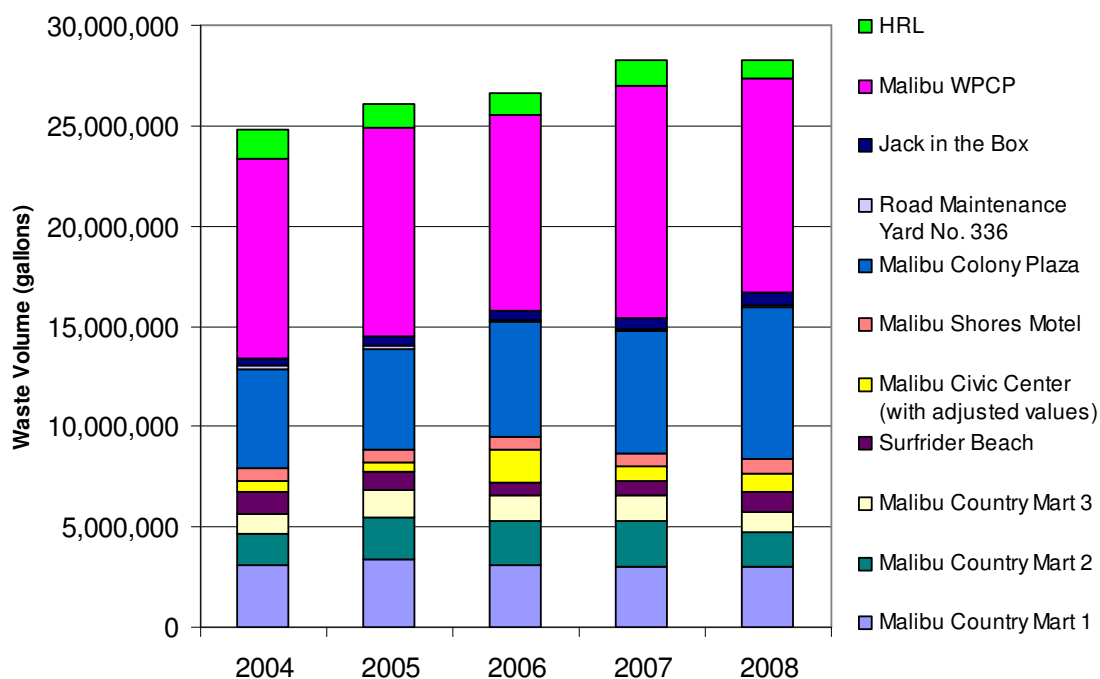
D
R
A
F
T

J
U
L
Y

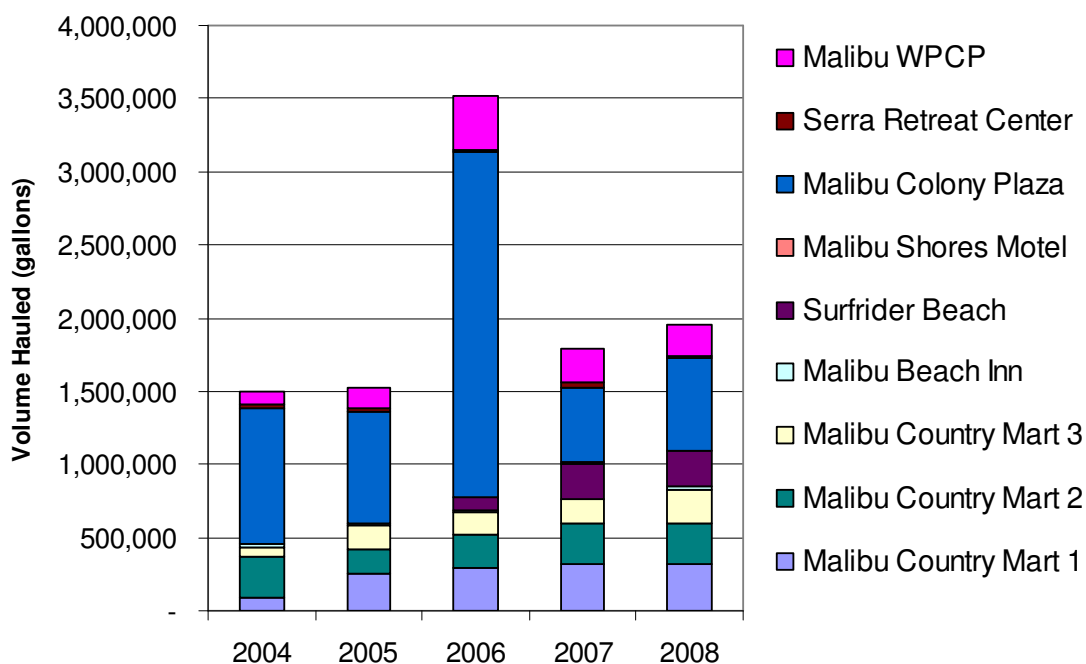
3
1

2
0
0
9

Combined Annual Waste Flows for Select Dischargers



Combined Annual Septic Waste Hauling for Select Dischargers



Staff also considered the carbon footprint of hauling practices, which generally use large diesel-powered tanker trucks that have to travel between 60 and 180 miles round trip to transport sewage. Staff estimates that hauling by these vehicles releases over 250 tons of carbon dioxide each year. Eliminating the need for sewage waste hauling would contribute toward the goals of California's Global Warming Solution Act by decreasing greenhouse gas emissions. Also, elimination of excessive hauling can help reduce public nuisances, such as traffic, noise, and odor resulting from these practices.

Conclusions

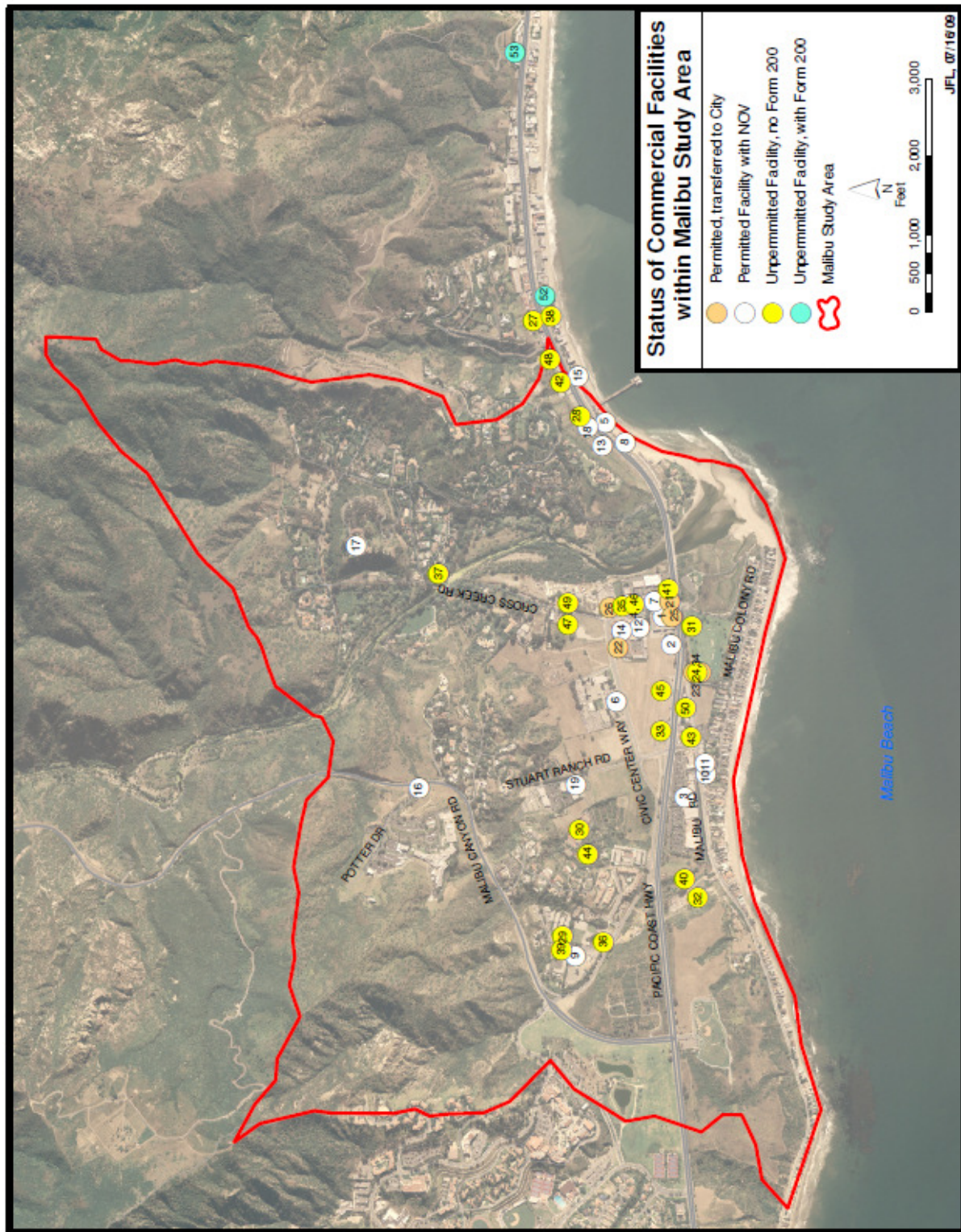
Discharges of wastewaters to the subsurface through OWDSs have degraded water resources and impaired existing and potential beneficial uses of these waters, as determined by the following conclusions from the technical memoranda.

- i. Dischargers subject to Orders from the Regional Board that specify waste discharge requirements (WDRs) and Time Schedule Orders (TSOs) have poor records of compliance.
- ii. Discharges of wastewaters contain elevated levels of pathogens and nitrogen that impair the underlying groundwater as a potential source of drinking water.
- iii. Discharges of wastewaters to groundwater that is in hydraulic connection with beaches along the mouths of unsewered watersheds contain levels of pathogens that elevate risks of infectious disease for water contact recreation.
- iv. Discharges of wastewaters that flow through groundwater and recharge Malibu Lagoon transport a nitrogen load significantly in excess of the allocation in the TMDL established to restore water quality to a level sufficient to protect aquatic life and prevent nuisance resulting from eutrophication.
- v. Generation of wastewater flows in the Civic Center area has been increasing. On many sites, hydrogeologic conditions are unsuitable for high flows of wastewater, and many dischargers generate wastewater flows at rates that exceed their capacity to discharge on-site. These dischargers rely on pumping significant flows into tanker trucks that haul liquid sewage and sludge via public roadways to communities that have sewer and wastewater treatment facilities.

Recommendation

Staff recommends that the Regional Board adopt Resolution R4-2009-xx to immediately prohibit all future discharges of wastewaters and to prohibit existing discharges of wastewater within five years of the Regional Board's adoption, i.e. by October 1, 2014.

Figure 1: Malibu Civic Center Area



D
R
A
F
T

J
U
L
Y

3
1

2
0
0
9